

VERIFICATIONS.

INDICATIONS.

The detailed comparison of the tri-daily indications for July, 1883, with the telegraphic reports for the succeeding twenty-four hours, show the general average percentage of verifications to be 87.37 per cent. The percentages for the four elements are: weather, 88.34; direction of wind, 86.28; temperature, 88.90; barometer, 85.87 per cent. By geographical districts they are: For New England, 86.82; middle Atlantic states, 90.34; south Atlantic states, 84.58; eastern Gulf, 86.82; western Gulf, 89.81; lower lakes, 85.57; upper lakes, 87.98; Ohio valley and Tennessee, 87.05; upper Mississippi valley, 87.93; Missouri valley, 82.56; north Pacific, 100.0; middle Pacific, 100.0; south Pacific, 100.0.

There were one hundred and twenty-one omissions to predict out of 3,813, or 3.17 per cent. Of the 3,692 predictions that have been made, eighty-four, or 2.27 per cent., are considered to have entirely failed; one hundred and one or 2.74 per cent. were one-fourth verified; four hundred and seven, or 11.02 per cent., were one-half verified; four hundred and twelve, or 11.16 per cent., were three-fourths verified; 2,688, or 72.81 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

CAUTIONARY SIGNALS.

During July, 1883, sixty-seven cautionary signals were displayed. Of these, forty-eight, or 71.64 per cent., were justified by winds of twenty-five miles or more, per hour, at or within one hundred miles of the station. Eight cautionary off-shore signals were ordered, of which five, or 62.5 per cent., were justified both as to direction and velocity; six, or 75 per cent., were justified as to velocity only, and six, or 75 per cent., as to direction only. One cautionary signal was changed to an off-shore signal. Seventy-five signals, of all kinds, were displayed, of which fifty-three, or 70.66 per cent., were fully justified. These do not include signals ordered at display stations where the velocity of the wind is only estimated. One signal was ordered late.

One hundred and forty-four winds of twenty-five miles, or over, per hour were reported, for which no signals were ordered. Many of these were high local winds or strong sea-breezes.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Brilliant auroral displays occurred on the nights of the 29th and 30th. They were generally observed from Dakota eastward to New England, and as far southward as southern Virginia. The following descriptions relate to the display of the 29th:

Boston, Massachusetts, 29th.—An auroral light was observed at 9.30 p. m., which gradually extended until the whole northern sky was covered with patches of light, with waves of the auroral light flashing across them. A bright band of yellow light, 4° in width, extended from the western sky to the zenith. At midnight an arch was formed, with a dark segment beneath it. The display continued until the morning of the 30th, gradually fading as the night advanced.

Philadelphia, Pennsylvania, 29th.—A faint auroral display was observed in this city between 10.30 and 11.30 p. m. A few light flashes of light appeared near the centre of the display.

Barnegat City, New Jersey, 29th.—A fine auroral display was witnessed at this place between 8.30 and 11.30 p. m. It first appeared as a bright light in the north, and later developed into beautiful "merry dancers." Brilliant beams appeared, reaching nearly to the zenith. At 10 p. m. the aurora assumed the form of an arch, which gradually faded away.

Washington, District of Columbia.—At 9.08 p. m., of the 29th, auroral streamers were plainly visible, extending to 20° above the northern horizon, and from N. 15° E. to N. 15° W. These streamers increased in brilliancy at 9.10 p. m., when irregular patches of bright red color appeared, having a seem-

ing motion to the westward. At 9.30 p. m. there was left a bright hazy appearance in the northwest, without streamers.

Variety Mills, Virginia, 29th.—An auroral display was visible here from 9 to 10 p. m. It appeared as a steady glow of light near the northern horizon, extending from north to northeast. The display was partially obscured by clouds from 9 to 10 p. m., and became wholly obscured at 10.15 p. m.

Erie, Pennsylvania.—A faint auroral display was seen from 8.40 p. m. of the 29th until 2 a. m. of the 30th; it first appeared in the northeast and gradually extended westward.

Escanaba, Michigan, 29th.—The aurora was visible at this station from 9 p. m. until the early morning of the 30th. It first appeared as a large beam of straw-colored light, extending across the sky from the eastern to the western horizon. Later the entire northern sky became covered with the light, the beams converging to a point near the zenith. The display continued with considerable brilliancy until after midnight.

Saint Vincent, Minnesota, 29th.—The auroral display was visible at 9.30 p. m., at first consisting of single beams in the northeast; ten minutes later beams shot up from all parts of the horizon and continued until about 10 p. m., when the display became faint and gradually disappeared.

Fort Totten, Dakota, 29th.—An auroral display began at 9.20 p. m. in the northeastern sky; beams appeared, lasting until 10 p. m., when an auroral arch of great beauty was formed, with a dark segment beneath it. The display ended at 11.25 p. m.

The auroral display of the evening of the 30th was very similar to the one above described, and it was generally observed at the same stations.

Other displays were observed during the month, as follows:

1st.—Mount Washington, New Hampshire; Point Judith and Block Island, Rhode Island; Woodstock, Vermont; Oswego and Ithaca, New York; Lansing, Michigan; Morrison, Illinois; Bismarck, Dakota; Nebraska City, Nebraska.

2d.—Spokane Falls, Washington Territory; Wilkesbarre, Pennsylvania.

3d.—Northfield, Minnesota; Nebraska City, Nebraska.

4th, 5th, and 6th.—Northfield, Minnesota.

7th.—Menand Station (near Albany), New York; Wilkesbarre, Pennsylvania; Duluth and Northfield, Minnesota.

8th.—Eastport, Maine; Mount Washington, New Hampshire; Alpena, Michigan.

9th.—Eastport and Portland, Maine; Woodstock, Vermont; Amherst, Massachusetts; Point Judith and Block Island, Rhode Island; Oswego and Madison Barracks, New York; Alpena, Escanaba, Lansing, Marquette, and Mackinaw City, Michigan.

10th.—Escanaba and Swartz Creek, Michigan; Woodstock, Vermont; Eastport, Maine.

16th.—Northfield, Minnesota.

18th.—Escanaba, Michigan.

23d.—Fort Totten, Dakota.

24th.—Point Judith, Rhode Island; Menand Station (near Albany), New York.

26th.—Saint Vincent, Minnesota.

31st.—Narragansett Pier and Point Judith, Rhode Island; Woodstock, Vermont; New Bedford, Fall River, and Rowe, Massachusetts; Barnegat City, New Jersey; Wytheville, Virginia; Ithaca, New York; North Lewisburg, Ohio; Lansing and Thornville, Michigan; Morrison, Illinois; Lafayette, Indiana; Cresco and Nora Springs, Iowa; Ripon and Sussex, Wisconsin; Northfield, Minnesota.

The s. s. "Lord Gough," in N. 42° 41', W. 61° 50', at 2 a. m. (Greenwich mean time), of July 2d, observed a bright auroral display.

On the 5th the Norwegian bark "Saga," near N. 50° 20', W. 40° 02', saw northern lights.

THUNDER STORMS.

Thunder storms were reported in the various districts on the following dates:

New England.—1st to 8th, 12th to 15th, 17th, 22d, 23d, 24th, 26th to 31st.

Middle Atlantic states.—1st to 8th, 11th to 17th, 21st to 24th, 26th to 29th, 31st.

South Atlantic states.—1st to 19th, 21st, 23d to 31st.

Florida peninsula.—1st to 8th, 10th, 11th, 14th to 22d, 24th to 29th, 31st.

Eastern Gulf.—1st to 9th, 12th, 17th, 21st, 22d, 24th to 31st.

Western Gulf.—1st to 11th, 12th, 13th, 16th to 19th, 21st, 22d, 24th to 31st.

Tennessee.—1st to 9th, 11th to 17th, 23d, 24th, 25th, 27th, 28th, 30th, 31st.

Ohio valley.—2d to 9th, 11th to 17th, 20th to 24th, 26th, 28th.

Lower lakes.—2d to 8th, 10th to 17th, 20th to 24th, 27th to 30th.

Upper lakes.—1st to 7th, 10th, 11th, 12th, 14th, 15th, 16th, 19th to 27th, 30th, 31st.

Extreme northwest.—2d, 6th, 10th, 11th, 13th, 14th, 15th, 19th to 23d, 25th, 26th, 30th, 31st.

Upper Mississippi valley.—1st to 17th, 19th to 24th, 26th, 27th, 30th, 31st.

Missouri valley.—1st to 8th, 10th to 30th.

Northern slope.—2d to 6th, 8th to 11th, 13th, 15th, 19th, 21st, 22d, 24th, 25th, 29th, 30th, 31st.

Middle slope.—2d to 15th, 17th to 21st.

Southern slope.—3d, 5th to 9th, 11th to 15th, 20th, 22d, 23d, 25th, 26th, 27th, 31st.

Southern plateau.—1st to 6th, 8th to 12th, 17th to 31st.

Middle plateau.—1st, 3d, 4th, 6th, 9th, 13th, 20th, 21st, 26th, 28th to 31st.

Northern plateau.—10th, 29th.

Pacific coast.—Roseburg, Oregon, 8th, 9th; Fort Klamath, Oregon, 9th; Oakwood, California, 10th; Fort Bidwell, California, 26th.

Instances of damage by lightning during the month of July have been very numerous. The following are some of the more important cases:

Milwaukee, Wisconsin: a man and horse were killed by lightning on the street in this city on the morning of the 4th.

Scranton, Pennsylvania: several objects were struck by lightning at Dickson City, near here, on the night of 5-6th.

Detroit, Michigan: considerable damage was done to the instruments by lightning at the telephone exchange on the 11th.

Underhill, Chittenden county, Vermont: during a heavy thunder storm on the 13th a schoolhouse was struck by lightning, and all of the pupils were more or less injured. The floor of the school room was torn up, and the walls and ceilings were wrecked, and large holes were made in the ground in the school yard. Several trees near by were also struck.

Portland, Maine: several objects in this city and vicinity were struck by lightning and damaged to a more or less extent during the thunder storm of the 13th.

Nashua, New Hampshire: at 5 p. m., of the 13th, a residence in this city was struck by lightning and one person killed. Damage by lightning on this date was done at numerous points in New Hampshire and Vermont.

Latrobe, Westmoreland county, Pennsylvania: a large barn at Pleasant Unity, in this county, was struck by lightning and destroyed on the afternoon of the 13th, causing damage estimated at more than \$4,000.

Cleveland, Ohio: during the thunder storm of the 13th numerous objects in and about the city were struck by lightning, and damaged to a more or less extent.

Anna, Union county, Illinois: a man and team were killed by lightning at this place on the 13th.

Fidelity, Jersey county, Illinois: at about 4 p. m., of the 16th, a dwelling at this place was struck and badly damaged by lightning. Nearly all of the plastering and weather boarding were torn from the west end of the building, the windows were broken, and the chimney was burst from top to bottom.

Carthage, Jasper county, Missouri: a large barn and slaugh-

ter house at this place was struck by lightning and burned on the evening of the 17th. Several barns and other buildings were struck by lightning at Marshall, Saline county, in this state.

Jacksonville, Florida: numerous objects were struck and damaged by lightning during the thunder storm on the 18th.

Sanford, Florida: buildings at this place were injured by lightning on the 1st and 18th.

Wabasha, Wabasha county, Minnesota: during the thunder storm of the night of the 19th a dwelling was struck by lightning and burned.

Grand Haven, Michigan: on the 21st lightning struck the building in which the signal office is located, demolishing a flag-staff and damaging instruments.

Bismarck, Dakota: the building in which the signal office is located was struck by lightning and set on fire on the 23d.

Rich Hill, Bates county, Missouri: during a thunder storm, on the 24th, a man and team were killed by lightning.

Dayton, Washington Territory: the signal office and instruments were damaged by lightning on the 29th.

New London, Connecticut: four barns and two dwellings in the vicinity of this city were struck by lightning on the 29th, the damage caused being estimated at \$3,500.

Leavenworth, Kansas: seven barns in this locality were struck by lightning on the 30th.

ATMOSPHERIC ELECTRICITY INTERRUPTING TELEGRAPHIC CONNECTION.

Fort Macon, North Carolina: 29th.

Fort Stockton, Texas: 24th.

On the summits of Pike's Peak, Colorado, on the 14th and 25th, the atmosphere was highly charged with electricity, which had a peculiar effect upon the instruments.

OPTICAL PHENOMENA.

SOLAR HALOS.

Solar halos have been observed in the various districts on the following dates:

New England.—Provincetown, Massachusetts, 3d; Rowe, Massachusetts, 11th and 27th; Cornish, Maine; Strafford and Woodstock, Vermont, 24th; New Haven, Connecticut, 31st.

Middle Atlantic states.—Cape Henry, Virginia, 8th and 9th.

South Atlantic states.—Augusta, Georgia, 3d; Charleston, South Carolina, and Hatteras, North Carolina, 4th; Jacksonville, Florida, 17th.

Eastern Gulf.—Pensacola, Florida, 3d, 26th, 30th; Vicksburg, Mississippi, 25th.

Western Gulf.—Indianola, Texas, 1st; Lead Hill, Arkansas, 2d, 13th, 17th, 29th; Little Rock, Arkansas, 17th, 19th; Palestine, Texas, 27th.

Tennessee.—Nashville and Murfreesborough, 11th; Memphis, 12th, 19th, 30th.

Ohio valley.—Louisville, Kentucky, 10th; Frankfort, Kentucky, 10th, 20th; Vevay, Indiana, 4th, 28th; Laconia, Indiana, 13th; Griffin station, Indiana, 20th; Westerville, Ohio, 25th.

Lower lakes.—Cleveland, Ohio, 2d, 9th; Oswego, New York, 15th; Toledo, Ohio, 20th.

Upper lakes.—Lansing, Michigan, 2d, 20th, 29th; Swartz Creek, Michigan, 9th, 20th.

Extreme northwest.—Saint Vincent, Minnesota, 19th; Fort Buford, Dakota, 28th.

Upper Mississippi valley.—Cresco, Iowa, 7th; Polo, Illinois, 13th, 25th, 26th; Anna, Illinois, 13th, 29th; Saint Louis, Missouri, 17th; Monticello, Iowa, 20th; Swanwick, Illinois, 29th.

Missouri valley.—Nebraska City, Nebraska, 7th; De Soto, Nebraska, 7th, 21st, 24th, 26th, 31st; Johnson, Nebraska, 12th.

Middle slope.—Pike's Peak, Colorado, 11th; Yates Centre, 13th, 15th, 17th, 19th, 25th.

California.—Sacramento, 11th; San Francisco, 11th.

Utah.—Nephi, 4th.

LUNAR HALOS.

Lunar halos have been observed in the various districts on the following dates: